Cesarean Section Experience at the University of California Hospital

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SUMMARY

A review of the 746 cesarean sections performed at the University of California Hospital from 1907 through 1948 shows an over-all cesarean section incidence of 3.91 per cent. The maternal mortality rate associated with these cesarean sections has been 1.61 per cent. There has been a steady decline in mortality over the 40-year period and there have been no deaths from cesarean section in the last ten years. The over-all incidence of morbidity associated with cesarean section has been 40.5 per cent and again there has been a significant improvement in recent years. The fetal mortality associated with cesarean section has been 6.1 per cent. In view of recent experience, standards based on figures collected 20 years ago are no longer tenable.

STATISTICAL information accumulated over a 40-year span is of importance in that it is possible to obtain a sufficient perspective to appreciate changes that have taken place during this time. For this reason the following figures may be of interest.

Arnot,[1] in 1935, published the figures dealing with cesarean section at the University of California Hospital up to that time. His material has been reviewed and the findings brought up to date. This survey represents the complete story from 1907 through 1948 at this hospital.

On December 31, 1907, the first cesarean section was performed at the University of California Hospital on a 35-year-old primigravida. The rather sketchy information given showed an uncomplicated antenatal course. The patient had an inlet contraction with the diagonal conjugate measurement being 11 cm. The membranes ruptured prematurely seven hours before onset of uterine contractions. Shortly after uterine contractions began, the patient was hospitalized and continued in labor for 12 hours. In spite of frequent and strong contractions the infant's head did not engage and delivery by cesarean section was decided upon. The record at the time of operation is of some interest: The anesthetic agent used was chloroform followed by open drop ether. Using the umbilicus as a midpoint, a 15 cm. midline incision was made. The uterus was exposed and incised. The operative note points out that at this time the "hemorrhage was extreme" and the placenta was found lying immediately beneath the incision. The placenta was penetrated and a living child delivered without further difficulty. A hypodermic injection of "aseptic ergot" was then given and the uterus massaged and irrigated with hot saline solution to stimulate adequate contraction. The uterus was closed in three layers, the first with interrupted Pagenstecher linen sutures, the second with interrupted No. 2 chromic suture material, and the outer layer with continuous No. 2 plain catgut. The abdomen was then filled with hot normal saline solution and the peritoneum closed with a continuous catgut suture the size of which was not stated. After the fascia was closed with a continuous suture of No. 2 chromic catgut, the skin edges were brought together with interrupted silkworm gut sutures and an iodoform gauze dressing which had been soaked in bichloride solution was placed over the wound. Dr. A. B. Spaulding, who later became professor of obstetrics and gynecology at the Stanford University Medical School, was the surgeon and the operation was completed in one hour. The patient had a febrile postoperative course and was critically ill for a number of days but was discharged as well on the 32nd postoperative day.

In terms of present-day obstetrics, one could be extremely critical of obstetrical care of this type, but when one considers the problem in relation to the state of medical knowledge at the turn of the century it is impossible to have any feeling other than admiration for the judgment, ability and courage displayed at this time. This, likewise, serves as a point of departure in orienting ourselves regarding the progress that has been made in obstetrics since 1907.

INCIDENCE

A total of 746 cesarean sections have been done at the University of California Hospital through December 31, 1948. During this same period of time 19,060 patients have been delivered at this hospital. This, then, gives a cesarean section incidence of 3.91 per cent. Disregarding the year 1911 when no cesarean sections were performed, the incidence varied from a low of 0.7 per cent in 1910 to a high of 8.5 per cent in 1932. During the past ten years the incidence has fluctuated between a low of 3 per cent in 1943 and a high of 4.9 per cent in 1940. In 1948 the incidence was 4.3 per cent.

There were 311 operations performed on private patients and 435 on clinic patients. However, in all instances, the decisions concerning the clinic patients were made by members of the senior staff who, likewise, were responsible for all but a few of the private patients. Thus, there was a fairly close continuity of

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thought and care with all patients, whether clinic or private. Because of the fact that there is no large slum district in San Francisco such as one finds in metropolitan centers in the eastern part of the U. S., these patients were usually in a state of moderately good nutrition. Until very recently there has been a negligible Negro population in San Francisco and the vast majority of the patients have been Caucasians with a sprinkling of Orientals.

In addition to these 746 cesarean sections, two postmortem sections were performed. These were not included in the analysis.

MATERNAL MORTALITY

From 1907 through 1948 there have been 12 maternal deaths among the 746 patients delivered by cesarean section. Thus, the mortality rate for this period of years was 1.61 per cent. If the figures are broken down into ten-year groups one finds that from 1907 through 1918 the mortality rate was 7.3 per cent. From 1919 through 1928 the rate was 4.4 per cent. From 1929 through 1938 the rate was 1.2 per cent. There have been no maternal deaths in association with cesarean section from 1939 to the present time, in a total of 329 cesarean operations. This, then, might be taken as a fairly graphic portrayal of the advance in obstetrical care at the University of California Hospital during this 41-year period.

It is of interest to compare these results with figures from other institutions. In 1909, Green[3] published a study on the results of the first 100 cesarean sections performed in the Boston Lying-in Hospital. This represented the period from 1894 to 1907. The maternal mortality was 8 per cent. Davis[2] published the results that had been obtained in the New York Lying-in Hospital from 1893 to 1914, and the associated maternal mortality was 10.7 per cent. These figures contrast with more recent data. Irving[4] presented a detailed analysis of the experience at the Boston Lying-in Hospital for the ten-year period from 1934 to 1943. The over-all maternal mortality was 1.3 per cent, and it was interesting to note that when broken down into five-year periods the data for the period 1934 to 1939 showed a mortality rate of 1.9 per cent while from 1939 to 1943 it was 0.7 per cent. Mack and Siddall[5] compared the results obtained in the years 1925, 1930 and 1945 in the city of Detroit. The maternal mortality dropped from 13 per cent in 1925 to 4.4 per cent in 1930 and then to 0.8 per cent in 1945.

The obstetrical literature contains many similar observations and those mentioned are typical examples of the improvement over the years. Thus, it can be seen that experience at University of California Hospital has paralleled that in other parts of the country.

No single factor has been responsible for this steady improvement—rather, it can be credited to the outgrowth of knowledge dealing with such things as anesthesia, the significance of blood loss and need for transfusion therapy, as well as a greater appreciation of some of the contraindications to cesarean section. It can be pointed out, for example, that chloroform has long since been discarded as an anesthetic agent; that blood transfusions are commonly used as a prophylactic measure in modern-day operative obstetrics rather than being reserved for the moribund patient as a measure of last resort; and that experience has taught the wisdom of a more judicious appraisal of the indication for, and possible contraindications to, a cesarean section.

The over-all maternal mortality at the University of California Hospital during this same period has been three per thousand, a total of 57 maternal deaths having occurred in the 19,060 deliveries. With many of these fatalities the pregnancy was purely incidental and in no way related to the cause of death—for example, deaths caused by encephalitis, tuberculosis, pneumonia and brain tumors.

A detailed analysis of the cesarean section fatalities is presented to emphasize the improvements that have taken place in obstetrical care. Keeping in mind the years when the fatalities occurred, no reflection is intended; rather, the purpose is to point out that certain fatalities in years gone by should be preventable at this time and that no one should be proud of a current mortality rate of "only 1 per cent."

CASE 1. 1913. A multipara, 37 weeks along in pregnancy with a premature separation of the placenta and profuse vaginal bleeding prior to operation. Cesarean hysterectomy was performed under chloroform and ether anesthesia. Death from bronchopneumonia occurred on the third postoperative day.

CASE 2. 1916. A primipara, 36 weeks along in pregnancy, experienced an episode of profuse vaginal bleeding. Rectal examination revealed placenta praevia. A classical cesarean section was done under nitrous oxide and oxygen anesthesia. The postoperative course was markedly febrile, terminating with death from bronchopneumonia on the 24th day.

CASE 3. 1916. A multipara, at term, experienced an episode of profuse painless vaginal bleeding. Placenta praevia was diagnosed. A classical cesarean section was done under nitrous oxide and ether anesthesia. Two severe hemorrhages occurred postoperatively and the patient died on the 11th day from peritonitis.

Although two of these patients died of bronchopneumonia and the third from a peritoneal infection, the cases have something in common. The indication for the operation in each instance was antepartum bleeding. In no case was a blood transfusion included as part of the therapy. Nothing points out more clearly the changes that have occurred in obstetrical care than the manner in which patients in similar circumstances are cared for at present. Hospital and community blood banks have made blood almost as easily available as normal saline solution, and it would be considered inexcusable at present to treat such patients without adequate amounts of blood on hand. This improvement, along with modern methods of anesthesia together with chemotherapeutic and antibiotic agents, should prevent deaths of this type.

CASE 4. 1920. A multipara, with a rachitic funnel pelvis, whose three previous pregnancies ended in stillbirths due to dystocia. Although the patient was not in labor, the membranes had ruptured two hours prior to operation. A classical cesarean section was done under nitrous oxide and ether anesthesia. The patient ran a "septic" temperature and death occurred on the 15th postoperative day from a probable blood stream infection.

This is another example of what would be considered a preventable death at present. It is, indeed, a rare infection that cannot be controlled with present therapeutic agents.

CASE 5. 1920. An unmarried primipara with many manifestations of a psychoneurosis. An elective cesarean section was done on the indication of "hysteria." Death occurred on the third postoperative day from a paralytic ileus and acute dilatation of the heart.

Nearly all physicians have seen patients in whom the psychological background was such that it was felt advisable to avoid traumatic labor. Psychiatric counsel along with modern analgesia might have resulted in a spontaneous delivery for this patient. Certainly, modern postoperative care has practically eliminated paralytic ileus as a cause of death and in view of the circumstances it can be said that such a death should be considered a preventable one.

CASE 6. 1921. A multipara with a contracted pelvis. Attempted vaginal delivery by means of high forceps was unsuccessful after a labor of ten hours and nine hours with ruptured membranes. This was followed by an attempt at craniotomy, during which procedure the uterus was ruptured. A cesarean hysterectomy was then performed with death from peritonitis on the fourth postoperative day.

One of the advances in obstetric knowledge has been the greater appreciation of the hazards surrounding a difficult forceps delivery. It is reasonable to consider that a similar patient might now be handled with an extraperitoneal type of section. Certainly the prognosis would be far better with this method and no doubt death could be prevented.

CASE 7. 1922. An elective cesarean section was done on a multipara who had mitral stenosis and insufficiency. The anesthetic used was nitrous oxide. Death from cardiac insufficiency ensued on the third postoperative day.

CASE 8. 1923. A primigravida with mitral and aortic valvular heart disease. A diagnosis of premature separation of the placenta was made following a small amount of vaginal bleeding. Cesarean section was done under nitrous oxide and ether anesthesia. Death from cardiac failure occurred on the eighth postoperative day.

There has been a change in the concept regarding the ability of cardiac patients to withstand labor. It is true, certainly, that far fewer patients are delivered by cesarean section on this indication, nowadays, than was the case 25 years ago. From the evidence at hand it is difficult to say whether these might be considered preventable deaths or not. It is probable that similar patients operated upon at this time would not receive an inhalation anesthetic. It is believed that local anesthesia gives a greater margin of safety.

CASE 9. 1925. A multipara with a contracted pelvis and a history of two previous stillborn infants. An elective classical cesarean section was done with nitrous oxide and ether used for anesthesia. Marked abdominal distention developed postoperatively and death from a paralytic ileus and acute dilatation of the stomach occurred on the seventh day.

No autopsy was obtained in this case but the records suggest that peritonitis played a part in the production of the ileus. Fortunately again, it is now possible to approach this problem in a much more specific manner than was the case 25 years ago, and such a death would now be considered preventable.

CASE 10. 1931. The patient had severe rheumatic heart disease, and an elective low cervical cesarean section was done under local anesthesia. The patient had a smooth postoperative course and was discharged on the 14th postoperative day. Ten days after discharge, that is, the 24th postoperative day, she suddenly died at home and an autopsy revealed an acute dilatation of the heart as the cause of death.

It is probable that this patient was allowed to return home after too short a period of time in the hospital. A cardiac consultant who is able to work closely with the obstetrician and who is aware of the problems peculiar to obstetrical patients can be of the greatest value. One cannot but wonder if the outcome might not have been different if such a consultant had been available and if the patient had been kept under observation for a longer period.

CASE 11. 1936. A multipara whose previous obstetrical history was pertinent in that her first pregnancy had been terminated by means of a cesarean section, while with her second pregnancy she had a spontaneous vaginal delivery. For this, her third pregnancy, the decision was made to deliver her again by cesarean section. She was admitted to the hospital at term in early labor and was quickly taken to the operating room where a low cervical section was performed. Blood loss at the time of operation was estimated to be 1,000 cc. No transfusions were given. The patient died four hours after operation from acute pulmonary edema and acute cardiac decompensation.

In this instance, certainly, the cause of death was primarily the hemorrhage at the time of operation. Open to serious question also are the indications upon which the operation was done. Certainly a death under these circumstances should be placed squarely on the obstetrician's shoulders and it is an avoidable one from several viewpoints.

CASE 12. 1938. The patient was a primigravida upon whom an elective low cervical section was performed because of a contracted pelvis. Aside from a low grade febrile postoperative course, there were no complications. Death occurred suddenly on the 10th postoperative day from a massive pulmonary embolus.

This unfortunate outcome is one of the constant threats in any surgical procedure. During the past five years the policy of early ambulation of all patients, including those who have had a cesarean section, has been adopted and it is believed that there has been a definite decrease in the incidence of postoperative vascular complications as a result. It must be appreciated, however, that even with early ambulation occasional patients will die of a massive embolus, and to this extent the death in this case must be considered unavoidable.

Thus, eight out of the 12 deaths should be considered preventable in the light of modern obstetrics. Three of the remaining four patients—the three who died because of cardiac disease—might conceivably have survived had their care been comparable to that now given to cardiac patients. It should be emphasized that among these 12 fatal cases there was but one patient who received a blood transfusion. This is in direct contrast to present-day figures at University of California Hospital: 28 per cent of the patients are given transfusions during cesarean operation and 35 per cent receive transfusions postoperatively, the vast majority of the transfusions being entirely prophylactic in nature.

MATERNAL MORBIDITY

An analysis of the incidence of morbidity has been carried out and it is noted that of the 746 patients who had cesarean section, 302 had a morbid postoperative course, an incidence of 40.5 per cent. This is based on a febrile response to 38 C. on any two days excluding the first 24 hours postpartum. It may be pointed out that the majority of these patients experienced a rapid return to normal and that the febrile reactions were of minor significance. Among 311 private patients the incidence was 32 per cent and among 435 clinic patients it was 45 per cent. This is a significant disparity and may be the result of the difference in experience of the surgeons. In examining the yearly incidence of morbidity two definite periods of improvement are apparent. In the early years most of the patients had a morbid course; in fact, through 1930 the annual incidence was usually above 60 per cent. During the thirties a drop occurred with most of the years having shown an incidence in the neighborhood of 40 per cent. Beginning with 1943 another significant decline occurred, the annual figures since that time having been in the neighborhood of 20 per cent. During the year 1947 a low of 11.4 per cent was reached. The reasons for this very real decline are not too apparent. Prophylactic chemotherapy and antibiotic therapy have been used infrequently. The general policy has been to reserve these agents for the management of specific infections as they arise, and certainly the infrequent prophylactic use of them is not sufficient to account for this improvement. It is probable that the reduction reflects the more widespread use of whole blood transfusions and improvements in anesthesia over the years.

FETAL MORTALITY

There have been 46 infant deaths associated with the 746 cesarean sections. This represents an uncorrected infant mortality of 6.1 per cent. The causes of death have been many: prematurity, congenital abnormalities, intra-uterine asphyxia associated with placental separation, and, in recent years, erythroblastosis have all played a part.

In an attempt to answer the question as to what might be the minimal fetal mortality associated with cesarean section, 284 cases were selected in which an elective section was done solely because of a prior section. These did not include any cases in which coincidental toxemia or a bleeding complication might have been a factor in the fetal outcome. In this group there were four fetal deaths, an incidence of 1.58 per cent. Three of these deaths were accounted for on the basis of prematurity alone; the infants weighed, respectively, 1,670 gm., 1,980 gm., and 2,290 gm. In the fourth case an unexpected complete fresh rupture of the uterus was found, with the infant and the placenta in the abdominal cavity at the time of operation.

Thus it appears that even with the elimination of all maternal factors, fetal deaths can be expected from time to time because of faulty judgment as to the size and development of the infant.

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